SALIENT CHARACTERISTICS
CAMERA CHAIN COPPER CABLE

The finished OTV cable shall contain five isolated cables with the following characteristics.

a. Four of the cables shall be 20 AWG.
b. Two conductors, twisted, shielded with a drain wire, polyethylene shall be the primary insulation material for each conductor; per KSC-SPEC-E-0031A, paragraph 3.3.2.
c. Cables sheath shall be a polyamide material; per KSC-SPEC-E-0031A, paragraph 3.3.5.
d. The fifth cable shall be 12 AWG, three conductors, twisted, shielded with a drain wire.
    a. Polyethylene shall be the primary insulation material for each conductor; per KSC-SPEC-E-0031A, paragraph 3.3.2.
    b. Cables sheath shall be a polyamide material; per KSC-SPEC-E-0031A, paragraph 3.3.5.

The finished OTV cable shall have the following characteristics:

a. Overall shield that wraps the five isolated cables.
b. Be protected with a double-layer sheath consisting of a polychloroprene compound; per KSC-SPEC-E-0031A, paragraph 3.3.7.

Conductors shall have the following characteristics:

a. Formed by stranding tinned copper wire having a uniformly circular cross section.
b. Copper strands shall be pure copper and comply with KSC-SPEC-E-0031A, paragraph 3.3.1.
c. Finished conductor sizes are specified per KSC-SPEC-E-0031A

Figure 1 depicts the cable configuration and Table 1 the conductor color coding.

And constructed with a tin coated copper, round shield wire (type symbol T)

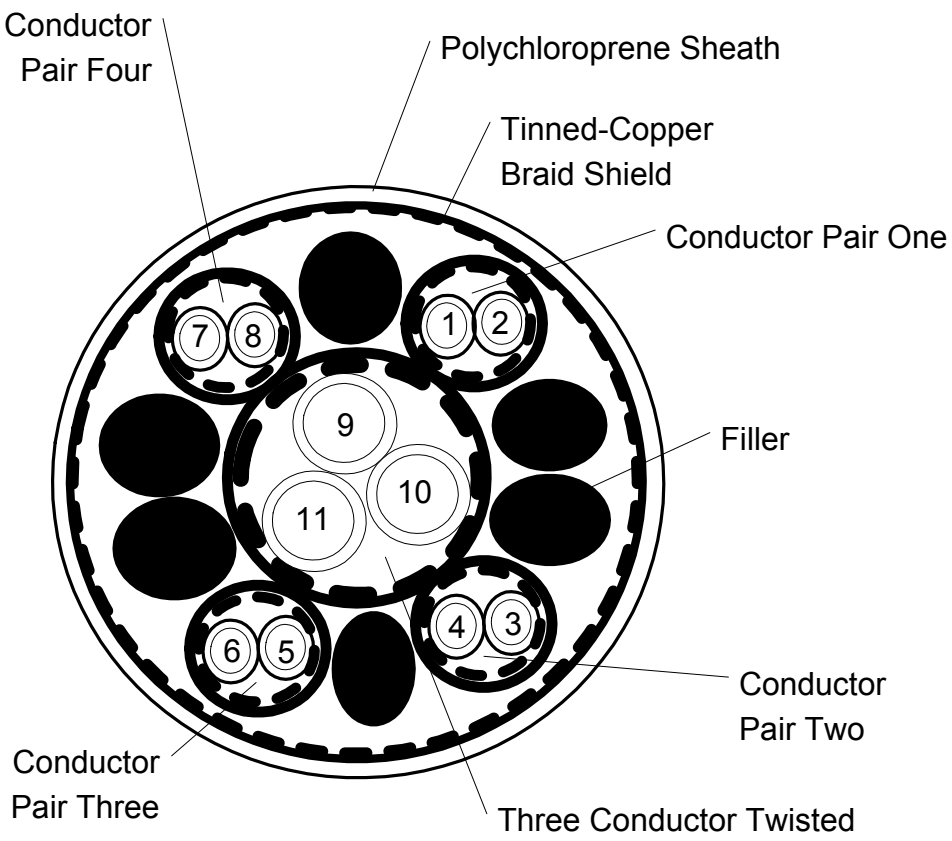

Figure 1.
Cable Configuration

Table 1

Conductor Pairs One thru Four

Conductor	Color
3	white/blue
4	white/orange
5	white/green
6	white/red
7	white/black
8	white/yellow
9	white/violet
10	white/gray

Three Conductor Twisted

Conductor	Color
9	white
10	white/blue
11	white/orange

Strands shall conform to ASTM B33 and be free from the following:

a. Lumps.
b. Kinks.
c. Splits.
d. Scraped or corroded surfaces.
e. Shin impurities.

Textiles used for separators and tape markers shall consist of the following:

a. Synthetic thread, or yarn, as applicable, conforming to the applicable fungus resistance requirements of ASTM G21.

Splices in individual strands or members shall be butt braze conductors. Per MIL-W-22759, Paragraphs 3.5.1.2, 4.1.2, and 4.6.2.3.4.

The jacketing material shall have the following characteristics:

a. A double-layer sheath that consists of a Polychloroprene (Neoprene) compound having the physical properties as specified in WC 3.
b. A synthetic reinforcement thread (nylon, polyester, or equivalent) between the two layers of polychloroprene sheath.
c. The polychloroprene sheath shall have an average thickness of 0.125 inches.
d. The minimum thickness at any point shall not be less than 0.110 inches.

Shall meet or exceed the following physical requirements:
Original Requirement:

a. Tear strength, minimum: 3.5 N/mm (20 lb/in).
b. Tension set, maximum: 9.5 mm (3/8 in).
c. Elongation at rupture, minimum: 300 %
d. Tensile strength, minimum: 12.4 Mpa (1800 psi)

Aging Requirement:

a. Tensile strength, minimum percent of original value: 80%
b. Elongation at rupture, minimum percent of original value: 80%

Testing Requirements
The following tests shall comply with Section 3.5.5 of specification KSC-SPEC-E-0031A:

a. Elongation Tests
b. Tin Coating (Individual Strands) Tests
c. Conductor Resistance Tests

Conductor Insulation Testing
The following test shall be made in accordance with method 3021 of FED-STD-228:

a. Tensile strength tests.

The following test shall be made in accordance with method 3031 of FED-STD-228.

b. Ultimate elongation test.

The following applies to accelerated aging:

a. Accelerated aging shall be in accordance with ASTM D470.
b. Before and after accelerated aging, the tensile strength and elongation at rupture shall conform to the aging requirement specified in table 3 of specification KSC-SPEC-E-0031A.
c. Specimens of polyethylene shall be oven-aged for 48 hours at a temperature of 100 +/- 1degree C.

Test Report
An acceptance test report shall be prepared and furnished by the contractor with the delivered cable to document the results of the acceptance test and calibration of the equipment.
This report shall contain, as a minimum:

a. The test procedure
b. Completed data sheets for the Electrical Cable.

Inspection

a. The contractor is responsible for the performance of all inspection requirements.
b. The Contractor may use his own facilities or any commercial laboratory acceptable to the Government.
c. The Government reserves the right to perform any of the inspections set forth in the ATP where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

Delivery Requirements
The preservation, packaging, and packing used for shipment or storage (or both), together with any special controls needed during transportation, shall adequately protect the equipment from damage or degradation of performance.

The contractor shall be responsible for the condition of the equipment delivered at the receiving point designated by the Contracting Officer.

Protection
Parts protection procedures, methods, materials, and devices (such as carts, boxes, containers, or transportation vehicles) shall be used to prevent damage to components.

Marking For Shipment
Containers shall be clearly marked and labeled as to contents and contract numbers, including the precautionary markings needed to ensure the safe handling, transport, and storage of the item.

Environmental Requirements
The cable and connector shall be capable of operating to specification for the following conditions:

a. Ambient temperature from -15 to 60 degrees centigrade without degradation.
b. Humidity zero to 95 percent non-condensing.

Cable Test Data
The cable manufacture shall provide the following:

a. Government test data.
b. Physical parameters.
c. A certificate of compliance.

The cable manufacture shall test each cable per KSC-SPEC-E-0031A and provide the test results.

Government Approval
The cable manufacturer shall provide the Government the fiber manufactures test procedures and test data upon receipt of the fiber.

The cable manufacture shall provide the Government the test procedure for the finished cable for review and approval 30 days prior to testing. This shall include test methods, test data sheets, test equipment setups with block diagrams.

The Government shall review and approve all test data on the finished cable before shipment by manufacture.

Workmanship
The fiber optic cable shall be free of material and manufacturing defects such as:

a. Dimensional non-uniformity.
b. Surface defects.
c. Internal defects that would impair the functionality of the cable.

Identification
The outer jacket shall have the following characteristics:

a. Bear the manufactures name
b. Year of manufacture
c. Have a length marker.
    a. The length marking shall employ continuous four-digit numbering in meters (ex: Manufacture's name - Year XXXX m).
    b. The marking shall be repeated clearly and distinguishably on every meter of the cables outer jacket.
    c. The marking ink shall be fully compatible with the jacket material.
    d. The marking ink shall be non-smearing.
    e. The marking ink shall be non-water-soluble.
    f. The marking ink shall be abrasion-resistant.
    g. The marking ink shall be durable enough to withstand field handling during placement and subsequent operations.

Preparation for Shipment
The cable shall be shipped based on the following:

a. All cable shall be shipped on non-returnable reels.
b. The diameter of the reels drum shall be at least 13 times the diameter of the cable.
c. The reels shall be substantial and constructed to prevent damage to the cable during shipment or handling.
d. The outer end of the cable shall be securely fastened to the reel head.

e. The inner end of the cable shall be fastened into a slot on the side of the reel with sufficient length for testing.
f. The inner end shall be fastened such that the cable will not become loose during installation.
g. The cable and connector require outside environmental protection with a temperature range from -40° C to +65° C and relative humidity from 0 to 100%.
h. Plug covers for connectors shall be applied to the appropriate end of the cable as required to protect the cable and connector from outside conditions.
i. Quantity and length of the cable shall be specified on the purchase order.

Quality Control System
The Contractor shall establish and maintain a quality control system, which satisfies the requirements of ANSI/ASQC Q9001-1994, quality System Model for Quality Assurance in Design, Development, Production, Installation, and Servicing. NASA retains the right to perform audit of contractor's system to verify compliance.

Quality Manual
The Contractor shall provide the following:
a. A detailed quality manual shall be prepared in accordance with ANSI/ASQC Q9001-1994, paragraph 4.2.1.
b. Three (3) copies of the manual shall be submitted to the Contracting Officer for approval.

Note: If contractor has received ISO 9001 accreditation from a 3rd party registrar, then the contractor may submit a copy of their certification credentials in lieu of the Quality Manual submittal.

Deviations and Waivers
When the contractor proposes to perform work, which does not conform to the applicable contract drawing requirements and specifications, the contractor shall submit to the Contracting Officer, for approval, a written request for deviation or request for waiver on the non-conforming work. The Contracting Officer approved/denied request will be processed and returned to the contractor, prior to the work being performed to the deviation or waiver.

All contractor deviation and waiver requests shall be submitted on KSC Form 8-69, " Contractor Request to Use Non-Conforming Parts or Materials". The form shall be fully executed and include a proffer of consideration to the Government. The request must be technically supported by justification, rationale, design considerations, calculations, and other data as applicable, which permits ready and conclusive evaluation by the Government as to acceptability or nonacceptability.

Where a requested deviation or waiver on a particular aspect of the work has a relation to, or affects, other aspects of the work, those other aspects of the work shall be clearly identified and referenced. And, if the requested deviation or waiver necessitates a

deviation or waiver on other aspects, requests for all such deviations and waivers must be submitted concurrently.
Any request not submitted in strict accordance with this provision will not be considered.